GUIDELINES FOR PROTECTING BLANDING'S TURTLES AND THEIR HABITATS IN MASSACHUSETTS

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Last updated: 8 February 2001

INTRODUCTION

The Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife (the Division) has developed the following guidelines to assist property owners, land managers, consultants, and conservation commissioners with protecting Blanding's turtles (*Emydoidea blandingii*) and their habitats. The Blanding's turtle is listed as Threatened by the Division in Massachusetts, and activities proposed in or near its habitats are subject to review under Massachusetts laws. The Division intends to apply these guidelines in its review of Notices of Intent, pursuant to the Massachusetts Wetlands Protection Act regulations (310 CMR 10.59). Implementing these guidelines will also help property owners and land managers avoid potential violations of the Massachusetts Endangered Species Act (MGL c. 131A) and its implementing regulations (321 CMR 10.00).

Users of these guidelines are advised that they do not supersede any law, regulation, or official policy of this or any other agency. Rather, these guidelines are intended to complement existing regulatory review processes by providing scientifically based management recommendations. These guidelines include a summary of life history and habitat requirements of Blanding's turtles, a summary of pertinent laws and regulations, guidelines for avoiding adverse impacts to Blanding's turtles and their habitats, and literature cited.

LIFE HISTORY AND HABITAT REQUIREMENTS OF THE BLANDING'S TURTLE

Blanding's turtles inhabit a variety of wetland and upland types (Table 1). Adults may be found in ponds, rivers, marshes, fens, vernal pools, shrub swamps, forested swamps, and streams. Aquatic habitats for juveniles tend to be shallower and more thickly vegetated than those of adults, although often within the same wetland. In their wetland habitats, Blanding's turtles are often difficult to detect in Massachusetts. When moving over land, adults are conspicuous, but when they are resting on land and burrowed under leaf litter (for example, resting between daily movements) they can be easily overlooked. Hatchlings and juveniles are especially difficult to detect.

Blanding's turtles are well-suited to both aquatic and terrestrial environments, allowing them to spend much of the active season on land – nesting, estivating, basking, and traveling between wetlands (Table 1). They generally return to permanent wetlands in the fall and hibernate there, although they may also hibernate in vernal pools (B. Butler, unpubl. data).

Blanding's turtle activities vary according to environmental conditions, age, and gender, but adults exhibit an annual activity pattern that is generally consistent from year to year (Rowe and Moll 1991, Joyal 1996, Sajwaj et al. 1998). This general pattern consists of: 1) emergence from hibernacula in permanent wetlands in the spring; 2) movement to other wetlands or other portions of the same wetland (both overland and aquatic movements) for foraging and/or breeding; 3) movement to nesting sites; movement to estivation sites (sites are terrestrial or aquatic); 4) movement back to aquatic hibernation sites in the fall.

Blanding's turtles emerge from hibernation in late March and remain active until as late as late November (Rowe and Moll 1991). During this time, they use both terrestrial and aquatic habitats, with most terrestrial activity occurring in April, May, June, and September (Gibbons 1968, Rowe and Moll 1991). Rowe and Moll (1991) found that adult males spent up to 20 consecutive days on land, and females spent up to 17 consecutive days on land, while on nesting excursions. Blanding's turtles estivate on land and in the water, intermittently from late July to late August (Ross and Anderson 1990, Joyal 1996).

During the active season (March through November), Blanding's turtles are capable of long-distance movements overland (Tables 2 and 3). The maximum straight-line distance that a Blanding's turtle has been known to move overland between wetlands is 2,900 m, in an 11-day period (Sajwaj et al. 1998). The maximum distances recorded in one season in other studies are 2,050 m (Joyal 1996) and 1,400 m (Rowe and Moll 1991). Recorded distances traveled from wetlands to nest sites range from a minimum of 100 m to a maximum of 1,620 m (Joyal 1996) (Table 3). In Massachusetts, a Blanding's turtle was recorded moving 1,700 m in less than 12 hours (B. Butler, unpubl. data).

Mating has been observed at various times of the year. All mating that Joyal (1996) observed in Maine was during June and July. In Minnesota, Sajwaj et al. (1998) observed 2 mating periods: May 1 to May 19, and August 15 to October 17.

Most Blanding's turtle nesting observations have occurred in open, non-forested habitat, such as grasslands, cornfields, dirt roads and roadsides, and fields (Linck et al. 1989, Ross and Anderson 1990, Lang et al. 1998). The nesting season lasts 16 to 29 days each year (Congdon et al. 1983). Most nesting occurs in June, but it can begin as early as May 23 (Congdon et al. 1983) and can end as late as July 11 (Sajwaj et al. 1998). Clutch size ranges from 3 to 22 eggs per nest (Congdon and van Loben Sels 1993, Ernst et al. 1994), and average clutch size ranges from 8.5 (Joyal 1996) to 10.6 (Butler and Graham 1995, Standing et al. 1999).

On average, Blanding's turtle hatchlings emerge 83 days after egg deposition (Congdon et al. 1983, Sajwaj et al. 1998). Emergence occurs from late August through early October (Congdon et al. 1983, Joyal 1996, Sajwaj et al. 1998). Hatchlings have been known to remain on land for at least 20 days after emergence (B. Butler, unpubl. data), and some evidence suggests that terrestrial hibernation following emergence may be possible (Standing et al. 1997). When they enter flooded wetlands, they are rarely the same wetlands that adults inhabit (Butler and Graham 1995, McNeil and Herman 1998). Blanding's hatchlings are not known to overwinter in their nests.

The sizes and ages of sexual maturity are not well documented for Blanding's turtles. Congdon and van Loben Sels (1993) estimated the age of sexual maturity to be 14 to 20 years old. The smallest recorded mature male was 181 mm in plastron length (Graham and Doyle 1977), and the smallest recorded mature female was 157 mm in plastron length (Congdon and van Loben Sels 1993).

Adult Blanding's turtles require very high annual survival rates (relative to many other vertebrates) to maintain population stability (Congdon et al. 1993). Congdon et al. (1993) estimated that a mean annual survival rate of 93% was necessary to maintain a sustainable population of Blanding's turtles. The oldest known-aged Blanding's turtle was 77 years old (Brecke and Moriarty 1989), and cohort generation time is estimated to be 37 years (Congdon et al. 1993). Therefore, annual adult survival must stay above 93% for 4 or more decades to protect just one generation. For juveniles, Congdon et al. (1993) estimated a 72% annual survival rate required to maintain population stability.

Adult Blanding's turtles feed on a variety of aquatic plants and animals, and preliminary research suggests that they are primarily carnivorous. Rowe (1992) found that snails and aquatic insects were the most frequently present food items in stomach and fecal contents.

Table 1. General habitats required by the Blanding's turtle.

Habitat type	**Description**	**Habitat functions provided for Blanding's turtles**	**Time of year used by Blanding's turtles (in Mass.)**
Wetland habitat	Most freshwater wetland types are used by a population (e.g. ponds, forested swamps, marshes, fens, shrub swamps, streams, rivers, seasonal pools). Adults overwinter in permanent wetlands (e.g. swamps, ponds, marshes, rivers) as well as vernal pools.	Overwintering, mating, feeding, shelter, estivating, basking	Year-round
Upland habitat	Various upland types (e.g. meadows, forests, shrubs) within 2,900 m of the wetland's edge. Nesting usually occurs in non-forested habitats (e.g. meadows, fields, dirt roads and roadsides).	Nesting, migrating, shelter, estivating, basking	Late March to late November, with heaviest use in April, May, June, and September

Table 2. Summary of overland movements recorded for Blanding's turtles moving between wetlands. Results are from radio-tracking studies.

	Straight line distance (m)				
Location	**Minimum**	**Maximum**	**Average**	**No. of individuals (duration of study)**	**Source**
Minnesota	0	2,900	426	46 (2 seasons)	Sajwaj et al. 1998
Maine	90	2,050	680	9 (2 seasons)	Joyal 1996
Illinois	a	1,400	a	2 (1 season)	Rowe and Moll 1991

a -- Data not reported

Table 3. Summary of overland movements recorded for radio-tracked Blanding's turtles moving to nest sites.

	Straight line distance (m)				
Location	**Minimum**	**Maximum**	**Average**	**No. of individuals (duration of study)**	**Source**
Minnesota	125	1,566	392[1];895[2]	31 (2 seasons)	Sajwaj et al. 1998
Maine	100	1,620	633	6 (2 seasons)	Joyal 1996
Massachusetts	Not reported	1,200	Not reported	9 (1 season)	Butler 1992
Illinois	650	900	815	3 (1 season)	Rowe and Moll 1991
Michigan[3]	200	1,200	750	35 (6 seasons)	Congdon et al. 1983
Michigan[3]	200	400	230	10 (6 seasons)	Congdon et al. 1983

1 Average for 1996 results.
2 Average for 1997 results.
3 Michigan results were presented for 2 subpopulations.

Threats to Blanding's Turtles – The greatest threats to existing populations of Blanding's turtles are those that increase the mortality (or removal from the wild) of adults and juveniles (Crouse et al. 1987, Congdon et al. 1993, Congdon et al. 1994). While significant and repeated losses of eggs and hatchlings can also lead to population decline, only slight increases in adult and juvenile mortality can have the same effect (Doroff and Keith 1990, Brooks et al. 1991, Congdon et al. 1993). Turtles require high survival rates because they – and other long-lived organisms – have evolved to balance their low reproductive rate with a long life span (see Gibbs and Amato 2000). In other words, they may require several decades of breeding before they succeed in replacing themselves in their populations.

Blanding's turtles that survive their hatchling and early juvenile years (the period when survival rates are naturally low) have traditionally been able to depend on long life spans. By adult size, their shells are an effective defense against most natural predators. However, humans have added – and continue to add – sources of mortality that turtles are poorly

equipped to avoid, including: cars and trucks, farm machinery and landscape equipment, and removal for pets (which is the demographic equivalent of mortality).

These sources of mortality also act as barriers to Blanding's turtle movement, as do obvious physical barriers such as fences, curbs, railroad tracks, and retaining walls. Roads, for example, fragment turtle habitat and make dispersal more difficult or impossible, depending on width, traffic volume, and construction features of the road. Fragmentation may lead to isolation of local populations, and isolation can increase a population's risk of extinction (Saccheri et al. 1998). An isolated population cannot receive dispersing individuals from other populations, a process that may be necessary to maintain genetic diversity and to sustain the population.

The loss of diverse wetlands – those containing diverse vegetation communities – threatens Blanding's turtles. Different age classes of Blanding's turtles depend on different vegetation densities in their wetland habitats (Barlow and Kingsbury 1998). In addition, hatchlings do not always enter the same wetlands that juveniles and adults inhabit, and they may depend on shallower, temporary wetlands, even dry vernal pool basins (Butler and Graham 1995, McNeil and Herman 1998). Removal of the forest canopy in the immediate vicinity of seasonal pools can degrade wetland habitat quality by negatively affecting amphibians (Raymond and Hardy 1991, deMaynadier and Hunter 1999). The eggs and larvae of amphibians that breed in seasonal pools may be an important food source for wood turtles.

Since Blanding's turtles often nest in and move through open upland habitats (Ross and Anderson 1990, Lang et al. 1998), they are vulnerable to activities that typically occur there. Plowing or otherwise excavating upland habitats can destroy nests and kill turtles. Mowing can also kill Blanding's turtles of all ages.

Predators, such as skunks and raccoons, threaten Blanding's turtle populations. Up to 100% of nests may be destroyed by predators in a given season (Ross and Anderson 1990). Providing attractants to these predators – such as exposed garbage, pet food, shelter – in or near Blanding's turtle habitat can adversely affect Blanding's turtle reproduction. Human presence can also easily disrupt nesting activity. Because a Blanding's turtle is likely to abandon her nest if disturbed before she has started to lay her eggs, human recreation in Blanding's turtle habitat can have a negative impact in this way. Recreation (without education and/or area restrictions) also leaves Blanding's turtles more vulnerable to collection for pets.

MASSACHUSETTS LAWS THAT PROTECT BLANDING'S TURTLES AND THEIR HABITATS

Massachusetts Wetlands Protection Act – The Massachusetts Wetlands Protection Act (WPA) (MGL c. 131 s. 40) protects a variety of wetland "Resource Areas" (and, in some cases, the surrounding uplands) that can support rare, state-listed wildlife. According to the WPA's implementing regulations (310 CMR 10.00), projects that are proposed to occur in a Resource Area or associated 100-foot buffer zone, and that will alter wetland habitat of Blanding's turtles or other rare wildlife, may have "no short or long term adverse effects" on that habitat. Specific protected Resource Areas that Blanding's turtles are likely to inhabit

include: Land Under Water Body; Isolated Land Subject to Flooding; Bordering Land Subject to Flooding; Bordering Vegetated Wetlands; and Riverfront Areas (Table 4). These are defined in detail in the WPA regulations.

The Division has prepared an atlas of “Estimated Habitats of Rare Wildlife,” including estimated habitats of Blanding’s turtles. The atlas is available from the Division and from local conservation commissions. When a proposed project will occur within an Estimated Habitat, a copy of the project proponent’s Notice of Intent to the local conservation commission must be forwarded to the Division. Within 30 days of receipt of the Notice of Intent, Division staff determine: 1) whether the proposed project would occur within actual habitat of a rare species; and, if so, 2) whether the proposed project will have any "short or long term adverse effects" on that wetland habitat. The Division submits their opinion to the applicant, the local conservation commission, and the Department of Environmental Protection. The Division's opinion is presumed correct, although it may be rebutted by clear evidence to the contrary.

The important wildlife habitat functions protected under the WPA are: feeding, breeding, migrating, overwintering, and finding shelter. Therefore, adverse impacts to habitats supporting these activities are not permitted. Replicating habitat for wetlands wildlife and moving animals to new habitat are not permitted because adverse impacts to existing habitat still occur. According to the Department of Environmental Protection’s rare species policy, “habitat replication, relocation of individual animals, or other proposed measures purported to offset adverse effects shall not be permitted because these activities cannot meet the performance standard of no adverse short or long term effect on the habitat of the local population” (DEP Rare Species Policy 90-2).

Table 4. Resource Areas (pursuant to Massachusetts Wetlands Protection Act) and associated habitat functions provided for Blanding's turtles.

Resource Area[1]	**Feeding**	**Breeding** (mating & nesting)	**Migrating**	**Overwint-ering**	**Shelter**	**Comments**
Land Under Water Body	adults juveniles hatchlings	adults	adults juveniles hatchlings	adults juveniles hatchlings	adults juveniles hatchlings	A pond and its buffer zone can provide habitat for most life stages.
Isolated Land Subject to Flooding (ILSF)	adults juveniles hatchlings	adults	adults juveniles hatchlings	adults juveniles hatchlings	adults juveniles hatchlings	ILSF may contain seasonal pools and other shallow wetlands used by turtles of all ages.
Bordering Land Subject to Flooding (BLSF)	adults juveniles hatchlings		adults juveniles hatchlings		adults juveniles hatchlings eggs	BLSF may contain seasonal pools and other shallow wetlands used by turtles of all ages.
Bordering Vegetated Wetlands (BVW)	adults juveniles hatchlings	adults	adults juveniles hatchlings	adults juveniles hatchlings	adults juveniles hatchlings eggs	BVW may provide wetland habitat for turtles of all ages, and its buffer zone may support nests.
Riverfront Area	adults juveniles hatchlings	adults eggs hatchlings	adults juveniles hatchlings	adults juveniles hatchlings	adults juveniles hatchlings eggs	A Riverfront Area can provide various wetland habitats, and its adjacent uplands can provide all habitat functions mentioned here.

1 All Resource Areas (except Isolated and Bordering Land Subject to Flooding) include a 100-foot buffer zone in which activities can be regulated if they will adversely affect the Resource Area itself. Riverfront Areas consist of adjacent uplands up to 200 feet from the high water line of a river or perennial stream. The uplands within the Riverfront Area are regulated as part of the Resource Area.

Assessing Impacts Under the WPA – To expedite regulatory reviews of large projects, projects with direct wetland alterations, and projects with significant buffer zone loss, applicants should follow the guidelines below.

- Applicants are strongly encouraged to conduct rare wildlife habitat evaluations prior to filing a Notice of Intent. Such evaluations are more likely to expedite the review process if conducted by a wildlife biologist with proven experience and expertise conducting surveys for the target species, in this case, the Blanding's turtle. The applicant should use the information provided in the evaluation to determine whether his or her project would adversely affect rare species habitat.

- Submit the full Notice of Intent to the Division, including plans, stormwater management forms and supporting data, wetland delineation forms, any wetland assessments, and any

wildlife habitat evaluations. Classifying wetland types according to Cowardin et al. (1979) will help facilitate the Division's review. Alternative analysis reports, as required under the Rivers Protection Act, must be provided.

- Clearly delineate boundaries of proposed work on a U.S.G.S. topographic map. Avoid drawing broad circles or using arrows to indicate the project locus.

- Provide plans that show the entire proposed project on one page, including streets and other landmarks. Plans drawn at a scale of 1:40 are often easiest to interpret. Delineate the limit of clearing on plans and show grading, limit of lawn, and all other project components.

- Delineate wetland Resource Areas, including Riverfront Areas, on plans. Make sure Bordering Vegetated Wetland flag numbers are clearly visible on plans. Delineate wet depressions that may be state or federal wetlands on plans.

- Provide ground-level photographs that characterize wetland types within and near the impact area(s). Label photographs and cross-reference them on 1:40 scale plans. Providing a 1:12,000 scale, color-infrared, aerial photograph (taken when leaves are off trees) with the subject property clearly marked is recommended.

- Provide land-use information for the site and neighboring lands. Include residential and commercial development, roads, agricultural land, and active or abandoned gravel pits. Demarcate these areas on the plans, if possible.

- Include detailed erosion and sedimentation control plans, particularly for sites with steep topography and for projects that will disturb large amounts of upland adjacent to wetlands.

- Submit to the Division any new or revised information presented to the Conservation Commission during the hearing process.

Massachusetts Endangered Species Act – The Massachusetts Endangered Species Act (MESA) (MGL c. 131A) prohibits the "taking" of any species of animal or plant listed as Endangered, Threatened, or Species of Special Concern. For animals, "taking" is defined as: "to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding, or migratory activity or attempt to engage in any such conduct, or to assist in any such conduct" (321 CMR s. 10.02). This broad definition of "take" allows regulatory protection to be provided to individual Blanding's turtles as well as to their wetland and upland habitats.

Under certain circumstances, the Division may grant a permit allowing the "take" of state-listed species as a result of a development project. Such "Conservation Permits" (321 CMR 10.04(3)) are granted only when there are no reasonable alternatives to the proposed project, when the project has been modified to minimize impacts to rare species and their habitats,

and when the project has been designed in such a way as to provide a "net benefit" to the population(s) of affected species. "Take" can also be allowed for research or educational purposes.

Assessing Impacts Under MESA – The Division may request additional site-specific information to aid in its regulatory review of proposed projects. This will be especially true for requests for Conservation Permits that allow limited take of Blanding's turtles under MESA. Although 1 to 2 years of additional data collection is unlikely to describe all habitats used by a local population of Blanding's turtles, it is likely to contribute information useful to the Division's review process.

In reviewing a project, the Division may request additional information on some or all of the following:

- Relative abundance of Blanding's turtles – This information is obtained by capturing turtles with dip nets, with traps, and by hand. Captured turtles should be individually marked, and the catch per unit effort should be calculated.

- Turtle movements and location of overwintering sites – Radio-track at least 10 adult males and 10 adult females. Track turtles for at least 2 activity seasons: from initial capture to November 15 and from March 15 to November 15 of the second season. Record locations every other day from April 15 to September 15, when turtles are most active on land. Record locations once a week during the rest of the season.

- Home range sizes and lengths – Map each turtle's movements (all radio-tracking locations) on separate 1:12,000 minimum scale air photos (leaves off, color infrared). Calculate the area (in hectares, using minimum convex polygons) and length (maximum distance between 2 outermost locations, in meters) for each turtle.

- Age classes of captured turtles – Turtle age classes are best estimated from shell morphometrics. Measure the following on all turtles when captured and recaptured (in millimeters): carapace length, plastron length, plastron width. Count the number of growth rings on the plastron. The number and percent of turtles with <14 growth rings on the shell, and the number and percent with plastron lengths of <160 mm should be calculated.

The Division issues permits for handling and capturing state-listed species in the field and therefore must be contacted before such activities are attempted.

GUIDELINES TO AVOID ADVERSE IMPACTS

Activities that may have adverse effects on Blanding's turtle habitat and/or may kill or injure adults, juveniles, hatchlings, or eggs include but are not limited to the following.

- Destroying wetland habitats by filling.

- Degrading wetland habitats by increasing erosion and sedimentation or discharging runoff and contaminants into wetlands.

- Altering the hydrology of wetland habitats. Adding impermeable surfaces nearby, such as pavement and buildings, can alter the hydrology of wetlands by increasing runoff. Water detention systems can alter hydrology by decreasing the amount of water that normally reaches the wetland.

- Undertaking activities that cause or significantly increase the likelihood of direct mortality to turtles or eggs. Examples include: building roads and parking lots; increasing traffic on existing roads; using machinery for landscaping, forest-cutting, lawn-mowing, and plowing. The probability that mortality will occur will likely increase with increased proximity of these activities to known turtle habitat.

- Construction of barriers to turtle movements, including walls and fences, ditches, curbs, railroads (non-elevated, without underpasses or overpasses), and roads (non-elevated, without underpasses or overpasses).

- Decreasing habitat diversity within wetlands or decreasing diversity and abundance of wetlands at a landscape level. Disrupting ecological processes that maintain diversity within and between wetlands may adversely impact Blanding's turtles. Altering hydrology by adding impervious surfaces (driveways, houses) or by installing retention basins can disrupt these processes.

- Increasing the amount of human activity in Blanding's turtle habitat, without providing sufficient undisturbed habitat, and without enforcing bans on the collection of Blanding's turtles.

Because Blanding's turtles commonly travel each year between habitat features that are hundreds or thousands of meters apart (Tables 2 and 3), the activities listed above have the potential to adversely affect habitat or cause "take" of Blanding's turtles if they occur up to 2.9 km from documented turtle sightings. However, not all development activities within the range of maximum movement are likely to adversely affect actual habitat areas or to cause a taking. Each proposed project will be reviewed by the Division separately, and consideration will be given to site-specific conditions, the nature and extent of the proposed activity, the extent and quality of local turtle habitat, and knowledge of both the general ecology and local status of Blanding's turtles.

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